CLAIMS

What is claimed is:

1. An apparatus for in-situ injection of one or more chemical components into a reaction chamber, comprising:

a reaction chamber for receiving one or more libraries, each of the libraries comprises two or more samples;

an injection module in fluid communication with the reaction chamber for permitting in-situ injection of one or more chemical components into the reaction chamber; and

a selectively movable transport assembly for selectively transporting said one or more libraries between said reaction chamber and the injection module.

2. The apparatus as defined in claim 1, wherein the selectively movable transport assembly is supported by a portion of the reaction chamber.

3. The apparatus as defined in claim 1, wherein the reaction chamber is defined by the interior surfaces of one or more housings.

4. The apparatus as defined in claim 3, wherein at least one housing may be selectively moved into sealing engagement with a second housing to form a completely sealed reaction chamber.

5. The apparatus as defined in claim 4, wherein the reaction chamber is pressurized by a charging agent.

6. The apparatus as defined in claim 1, wherein the reaction chamber is pressurized by a charging agent.

7. The apparatus as defined in claim 6, wherein a pressure gauge measures the pressure of the reaction chamber.

8. The apparatus as defined in claim 1, further comprising a selectively movable plate supported in the reaction chamber.

9. The apparatus as defined in claim 8, wherein the selectively movable plate comprises a rotatable carousel, the carousel defining one or more slots for retaining said one or more libraries.

10. The apparatus as defined in claim 8, wherein a spacer plate is mounted in the reaction chamber for adjusting the volume of space below the plate.

11. The apparatus as defined in claim 8, wherein a spacer plate is mounted in the reaction chamber for adjusting the volume of space above the plate.

12. The apparatus as defined in claim 1, wherein the injection module comprises an injection manifold supporting injectors for introducing chemical components into the reaction chamber.

13. The apparatus defined as in claim 12, wherein the chemical components are applied directly to the respective samples comprising the one or more libraries.

14. The apparatus as defined in claim 12, wherein the respective injectors are in fluid communication with at least one pump for delivering one or more of said chemical components to the respective injectors.

15. The apparatus as defined in claim 12, wherein one or more pneumatic cylinders are coupled to a selectively movable surface for moving the injection module a predetermined distance.

16. The apparatus as defined in claim 1, wherein the injection module is supported by a selectively movable surface.

17. The apparatus as defined in claim 16, further comprising one or more sensors for disrupting the movement of the movable surface upon detection of unwanted objects in the travel path of the movable surface.

18. The apparatus as defined in claim 1, wherein an electrical feed through electrically couples the one or more libraries to electronic or electrical components for gathering data concerning the samples, controlling electrical equipment, heating or cooling the samples or all four.

19. The apparatus as defined in claim 1, wherein a data gathering device is in optical communication with the reaction chamber and measures or records information determinative of one or more properties or one or more characteristics of reactions of two or more samples comprising said one or more libraries.

20. The apparatus as defined in claim 19, wherein the data gathering device is an infrared camera.

21. The apparatus as defined in claim 19, wherein the reaction chamber further comprises a sample viewing window.

22. The apparatus as defined in claim 21, wherein the viewing window is closed by a transmissive substance.

23. The apparatus as defined in claim 21, wherein the viewing window is closed by a sapphire window.

24. The apparatus as defined in claim 1, wherein the apparatus is placed inside a dry box.

25. The apparatus as defined in claim 1 or 24, wherein a data gathering device is supported by the apparatus.

26. The apparatus as defined in claim 25, wherein the data gathering device is an infrared camera.

27. The apparatus as defined in claim 25, wherein the data gathering device collects data serially or in parallel for the two or more samples of the one or more libraries.

28. The apparatus as defined in claim 1, further comprising one or more control valves for venting or controlling the pressure of the reaction chamber.

29. The apparatus as defined in claim 1, wherein the transport assembly comprises:

a selectively movable carriage;

a support member upon which the carriage rests; and

a drive system coupled to the carriage for moving the carriage along the support member.

30. The apparatus as defined in claim 29, further comprising a motor driven drive system for driving the carriage.

31. The apparatus as defined in claim 30, further comprising a threaded rod having one end coupled to the electric motor and an opposite end coupled to the carriage, wherein the threaded rod causes movement of the carriage as the motor rotates.

32. The apparatus as defined in claim 31, wherein the threaded rod is an acme screw.

33. The apparatus as defined in claim 29, wherein the support member is an elongated surface.

34. The apparatus as defined in claim 29, wherein the support member comprises one or more elongated rods.

35. The apparatus as defined in claim 29, wherein the carriage is fabricated of a material having a low thermal conductivity.

36. The apparatus as defined in claim 35, wherein the carriage is fabricated of a polymeric material.

37. The apparatus as defined in claim 1, wherein the one or more libraries are retained on a sample plate.

38. The apparatus as defined in claim 37, wherein the sample plate is fabricated of a polymeric material.

39. The apparatus as defined in claim 38, wherein the sample plate is supported by a support plate.

40. The apparatus as defined in claim 39, wherein the support plate comprises:

a top plate, and

a bottom plate for supporting the top plate, wherein the bottom plate comprises indexing pins for positioning the support plate in the reaction chamber.

41. The apparatus as defined in claim 40, wherein the bottom plate further comprises registration pockets for aligning the support plate with the transport assembly.

42. The apparatus as defined in claim 1, wherein the one or more libraries comprise two or more materials on a common substrate or in separate vials supported on a common substrate.

43. An apparatus for screening the properties or characteristics of reaction of two or more samples, comprising:

a first housing having at least a partially open center;

a second housing having at least a partially open center, wherein the partially open center of the first housing and the partially open center of the second housing are adapted for sealing engagement to define a reaction chamber;

an injection module in fluid communication with the reaction chamber for injecting chemical components into the reaction chamber; and

a transport module for transporting the two or more samples to the injection module.

44. The apparatus as defined in claim 43, wherein the injection module dispenses chemical components by in-situ injection.

45. The apparatus as defined in claim 43, wherein the first housing may be selectively moved into sealing engagement with the second housing to seal the reaction chamber.

46. The apparatus as defined in claim 43, wherein an electrical feed through electrically couples the said samples to electronic or electrical components for gathering data concerning the samples, controlling electrical equipment, heating or cooling the samples or all four.

47. The apparatus as defined in claim 43, wherein a data gathering device is supported by the first housing.

48. The apparatus defined in claim 43, wherein the transport module comprises:

a transport plate,

a selectively movable carriage supported by the transport plate for transporting two or more samples to the injection module, and

a drive system for driving the carriage.

49. An apparatus for screening the material properties or characteristics of reaction of two or more samples, comprising:

a first housing defining fluid inlet ports, said housing having at least one partially open surface;

a reaction chamber at least partially defined by a hollow center portion of said first housing, said first housing supporting a selectively movable plate in said reaction chamber, said movable plate defining one or more slots for receiving one or more libraries, each of the libraries comprising two or more samples;

a movable transport module supported by said housing for transferring the one or more libraries into or out of the reaction chamber; and

an injection module supported by a second selectively movable housing for in-situ injection of one or more chemical components onto respective samples of the one or more libraries, wherein said second housing may be moved into contact with said first housing to seal and enclose said reaction chamber.

50. The apparatus as defined in claim 49, further comprising a data gathering device supported by said first housing for obtaining information determinative of one or more characteristics of reaction or one more material properties of said two or more samples.

51. The apparatus as defined in claim 50, wherein a second data gathering device is supported by the second housing.

52. The apparatus as defined in claim 51, wherein the second data gathering device is coupled to the one or more libraries or other electronic or electrical components for gathering data concerning the samples comprising the one or more libraries, controlling electrical equipment, heating or cooling the samples or all four via an electrical feed through.

53. The apparatus as defined in claim 50, wherein the first data gathering device is an infrared camera.

54. The apparatus as defined in claim 50 or 51, wherein the first data gathering device or the second data gathering device collects data serially or in parallel for the two or more samples comprising the one or more libraries.

55. The apparatus as defined in claim 53, wherein a sample viewing window is defined by said housing for providing optical communication between the one or more libraries and the data gathering device.

56. The apparatus as defined in claim 55, wherein the viewing window is closed by a transmissive material.

57. The apparatus as defined in claim 56, wherein the viewing window is closed by a sapphire window.

58. The apparatus as defined in claim 49, wherein the injection module comprises an injection manifold.

59. The apparatus as defined by claim 58, wherein the chemical components are added to the one or more libraries or selected samples forming the library.

60. The apparatus as defined in claim 49, wherein the apparatus is placed inside a dry box.

61. The apparatus defined in claim 49, wherein the transport module comprises:

a transport plate,

a selectively movable carriage supported by the transport plate for transporting one or more libraries to the injection module, and

a drive system for driving the carriage.

62. The apparatus of claim 61, wherein the one or more libraries may be transported into or out of a pressurized reaction chamber without increasing or decreasing the pressure of the reaction chamber.

63. The apparatus as defined in claim 61, further comprising a motor driven drive system for driving the carriage.

64. The apparatus as defined in claim 63, further comprising a threaded rod having one end coupled to the electric motor and an opposite end coupled to the carriage, wherein the threaded rod causes movement of the carriage as the motor rotates.

65. The apparatus as defined in claim 49, wherein the one or more libraries comprise two or more materials on a common substrate or in separate vials supported on a common substrate.

66. The apparatus of claim 1, 43 or 49, wherein in the data gathering step is carried out serially or in parallel for each of the two or more samples.

67. A method of screening the material properties or characteristics of one or more material samples comprising the steps of:

providing a reaction chamber;

loading one or more sample plates into the reaction chamber, the sample plates supporting two or more samples;

sealing said reaction chamber; and

transporting the sample plates to an injection module of the reaction chamber for injection of one or more chemical components into the reaction chamber.

68. The method defined claim 67, wherein the transporting step can be carried out under pressure or at ambient conditions.

69. The method of claim 67, further comprising the step of pressurizing the reaction chamber with a charging agent.

70. The method defined in claim 67 further comprising the step of permitting the reaction chamber to come to pressure and temperature equilibrium after introducing the charging agent into the reaction chamber and prior to injecting chemical components into the reaction chamber via the injection module.

71. The method of claim 67 or 69, wherein the chemical components are injected onto the two or more samples.

72. The method of claim 67 further comprising a step of gathering data determinative of one or more material properties or one or more characteristics of reaction of the two or more samples.

73. The method defined in claim 67, further comprising the step of evacuating or purging said reaction chamber.

74. The method defined in claim 72, wherein the step of data gathering is performed using an infrared camera.

75. A method of screening one or more material properties or one or more characteristics of reaction of two or more samples comprising the steps of:

loading one or more library of samples into a reaction chamber;

sealing the reaction chamber; and

transporting the library of samples to an injection module for injection of one or more chemical components onto the samples comprising each library.

76. The method defined claim 75, wherein the transporting step can be carried out under pressure or at ambient conditions.

77. The method defined in claim 75, wherein the one or more library of samples comprises two or more materials on a common substrate or in separate vials supported on a common substrate.

78. The method defined in claim 75, further comprising the step of introducing a charging agent into the reaction chamber.

79. The method defined in claim 75, wherein the transporting step comprises the step of transporting the library of samples to an injection module in fluid communication with the sealed reaction chamber.

80. The method defined in claim 78 further comprising the step of permitting the reaction chamber to come to pressure and temperature equilibrium after introducing the charging agent into the reaction chamber and prior to injecting chemical components into the reaction chamber via the injection module.

81. The method of claim 75 or 78, wherein the chemical components may be injected onto the samples without increasing or decreasing the pressure of the reaction chamber.

82. The method of claim 80, further comprising the step of collecting data determinative of one or more material properties or one or more characteristics of reaction of the samples comprising the one or more libraries.

83. The method defined in claim 75, wherein the step of data gathering is performed using an infrared camera.

84. The method of claim 67 or 75, wherein the data gathering step is carried out serially or in parallel for each of the two or more samples.